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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of
  Tadashi Takano
  Hideaki, Takahashi
  Susumu, Ando

App. No.:   09/683286

Filed: December 10, 2001

Conf. No.:   8443

Title: PERMANENT MAGNET TYPE
         ROTOR AND PERMANENT
         MAGNET TYPE ROTARY
         ELECTRIC MACHINE

Examiner: D. Le

Art Unit: 2834

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APPELANTS BRIEF

Commissioner for Patents
P.O. Box 1450
Arlington, VA 22313-1450

Dear Sir:

RELATED APPEALS AND INTERFERENCES

There are no other appeals or interferences the outcome of which would have a bearing upon or be affected by the decision in this appeal.

REAL PARTY IN INTEREST

The real party in interest is, in addition to the appellants, their assignee, Kabushiki Kaisha Moric, a Japanese corporation.

STATUS OF CLAIMS

Claims 1, 2, 4, 5, 7, 9, 11, 12 and 13, the sole remaining claims are before the Board on this appeal, all having been finally rejected.

STATUS OF AMENDMENTS

No amendment was filed in response to the Final Rejection, thus the claims before the Board are in the form finally rejected. A clean copy of them appears in the Appendix of this brief.

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APPELLANTS INVENTION

Appellants' invention relates to an armature winding arrangement and its relation to the associated permanent magnets of an electrical machine such as a motor or generator. The windings are arranged and spaced along with the cooperating magnets to reduce what is called the "cogging torque".

This is a torque or load that resists the rotation as the wound poles pass the permanent magnets. This load reduces the efficiency of the machine and produces vibrations or uneven running.

Appellants achieve this by staggering the relationship to reduce additive effects from the prior art type machines where the configuration is symmetrical. In addition no two adjacent poles are surrounded by connected coil windings. The differences are apparent from a comparison of the cogging torque and counter emf curves of FIGS. 2 and 3 (prior art) and FIGS. 6 and 7 (an embodiment of the invention), respectively.

The invention is described more fully in the specification beginning at paragraph 0044 and carrying on through paragraph 0060 which describe the constructions shown in FIGS. 5-8 and 21-23.

ISSUES BEFORE THE BOARD

The several issues before the Board are:

Is the subject matter of claims 1, 13 and 14 obvious under 35 USC 103(a) from Konecny 4,774,428 (Konecny) in view of Kondo et al 5,900,687 (Kondo et al)?

Is the subject matter of claim 2 obvious under 35 USC 103(a) from the Konecny in view of Kondo et al rejection as applied against claim 1 in further view of Kordik et al 5,107,159 (Kordik et al)?

Is the subject matter of claims 4, 5, 7, 9 and 11 obvious under 35 USC 103(a) from Konecny, Kondo et al, Kordik et al combination as applied in the rejection of claim 2 in further view of Suzuki et al 6,081,058 (Suzuki et al)?

GROUPING OF THE CLAIMS

No two of the claims stand or fall together and the patentability of each claim will be argued separately.

APPELLANTS' ARGUMENTS

The Examiner attempts to justify his combination of the references on the basis that they "are all from the same field of endeavor". This is true only to the extent that they all relate to rotating electrical machines. However it is submitted that more than that is required to sustain a claim that one skilled in the art would make the combination proposed.

Appellants' invention is in the field of reducing cogging torque so as to reduce the power required to drive the machine (see paragraph 0004). In addition another of appellants' goals is to reduce unbalanced magnetic forces (see Paragraph 0007).

Konecny's goal is to provide "maximum energy efficiency and starting torque per unit volume of winding" (see his abstract). Kondo et al has the object of "providing a rational connection configuration" (see his abstract). Suzuki et al, like appellants is concerned with cogging torque, but is totally unrelated to the goals that those sought by the other two references the Examiner proposes to combine. Nevertheless Suzuki et al achieve their intended result in a way other than that claimed by the appellants.

Claim 1, the only independent claim before the Board recited a plurality of coil windings arranged in groups, a common feature, but deviates from the common and from the basic reference of Konecny in calling for "no two coil windings of each group being circumferentially adjacent to each other". The Examiner does not even acknowledge this limitation. On the other hand the Examiner states that the ends of Konecny are not connected to each other, but Kondo et al cures this problem.

Appellants do not contest the combination as the Examiner proposes it, but so made the quoted claim limitation is still unmet and thus the rejection as stated should not be affirmed.

Claim 13, which has been rejected with claim1 still further emphasizes this distinction by requiring the coil windings of each group to be "separated from each other by at least one coil winding of another group". Clearly not true of Konecny's preferred and only embodiment.

Claim 14 depends on claim 1 and calls for all pole teeth to be wound, a feature added to distinguish over another reference combined with Konecny in the first office action, but not now applied against this claim. Thus based only on the Konecny, Kondo et al combination, this claim stands or falls with claim 1.

Claim 2 is rejected as was claim 1 in further view of Kordik. Kordik does not cure the defect of the other two references in not having the windings of any pole tooth of any group circumferentially adjacent each other. This claim stresses the nonsymmetrical relationship to shift the cogging torques to reduce peaks. Kordik does use a nonsymmetrical relationship, but for a different reason.

He is concerned with an electric motor and the problem of starting one when the poles may be in a zero torque relationship. To avoid that, he staggers at least one pole to avoid a "torque ripple" and have the starting torque nearly the same as the running torque. This is not what appellants are trying to accomplish. Their goal deals with the problem of cogging torque which is not the same as the torque produced by the motor in the case of a motor and is irrelevant in the case of a generator. Cogging torque is related to drag in the machine and that is quite different. Again we must look to what the reference teaches to one skilled in the art, not to whether the structures can be modified to produce what is being claimed.

The Board should also note that except for the embodiment of FIG. 2 some coils of the groups of coils are on adjacent poles, even though in that embodiment they may be separated by unwound poles.

The remaining claims (4, 5, 7, 9 and 11) are rejected on the defective Konecny, Kondo et al Kordik combination, in further view of Suzuki et al. At the outset it should be pointed out that Suzuki et al does not show any detail as to the phase windings nor how they are related to each other and thus can not cure the problems noted above for the lack of pole winding arrangement as stressed in claim 1.

Also claim 4, from which all of the other claims of this group except for claim 5 depend, calls for the permanent magnets to have the same shape but an offset from the equal regularly disposed position (see FIG. 5). In Suzuki et al's Figure 4 the magnets are not all the same shape, but have different circumferential extents but regular spacing. Again this is because this is done for a different reason to achieve a different result.

Claim 5 does not depend on claim 4 but depends on claim 2 and thus partakes of its distinctions over the art. In addition this claim calls for the separate computation of the cogging torque by a computer analysis. There is no discussion of cogging torque in Kordik. His discussion of torque is output torque not the drag torque caused by the magnetic action.

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Claim 7 depends on claim 4 and further defines over the art alone or in expected combination and is very specific to the number of poles and magnets and the respective spacing of groups of the latter. The Examiner contends that this construction would be obvious but can point to no teaching that anticipates the basic combination. Thus one skilled in the art would not have a clue what would be an optimum geometric relationship because there is no teaching of the theory of the invention outside of that provided by appellants.

Claim 9 also depends on claim 4 and like claim 7 recites a specific, but different relationship. The same argument for patentability applies, but the claims do not stand or fall together.

Claim 11 also depends on claim 4 and like claims 7 and 9 recites a specific, but different relationship. The same argument for patentability applies, but the claims do not stand or fall together.

In view of the foregoing it is submitted that the Examiner simply has not made out a prima facia case of obviousness. Rather it is submitted that his building block type of rejections make it clear that he is not following the teachings of the references but rather is an attempt to reconstruct the inventive combinations by selecting bits and pieces of the prior art without taught motivation. A reversal of all rejections is therefore most respectfully requested.

A credit card authorization for the Brief Fee is attached.

Respectfully submitted:

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APPENDIX
CLAIMS ON APPEAL

1 A permanent magnet rotary electric machine having a rotor and a stator, one of said rotor and said stator comprising a plurality of permanent magnets disposed such that polarities of adjacent magnets are different from each other, the other of said rotor and said stator comprising a plurality of electrical coils wound around cores juxtaposed to said permanent magnets for cooperation therewith, said coil windings being arranged in groups of coil windings, the coil windings of said groups having their windings connected to each other and common ends, no two coil windings of each group being circumferentially adjacent to the other.

2. A permanent magnet rotary electric machine as set forth in claim 1 wherein one of the cores and the permanent magnets are disposed in nonsymmetrical relation to the axis of rotation of said machine.

4. A permanent magnet rotary electric machine as set forth in claim 2 wherein all the permanent magnets are of substantially of the same shape a circumferential offset angle of each permanent magnet from a regularly disposed position is set such that a cogging number per rotation of the rotor is equivalent to as the least common multiple of the number S of slots between the electrical winding cores and the number P of magnetic poles.

5. A permanent magnet rotary electric machine as set forth in claim 2, wherein the magnitude of the torque exerted on each permanent magnet is determined separately by a computer numerical analysis and peaks or bottoms of the torque curves of said permanent magnets are offset from each other with respect to the rotation angle of the rotor so that the cogging number is increased.

7. A permanent magnet rotary electric machine as set forth in claim 4, wherein the number S of slots is eighteen, the number P of magnetic poles is twelve, and the twelve permanent magnets are divided into four sets, each set comprising three circumferentially adjacent permanent magnets, the circumferential pitch angle of the three permanent magnets of each set is 26.7°, and the circumferential pitch angle of adjacent two permanent magnets between the sets is 36.60 °.

9. A permanent magnet rotary electric machine as set forth in claim 4, wherein the number S of slots is eighteen, the number P of magnetic poles is twelve, and the twelve permanent magnets are divided into four sets, two of said four sets comprising three circumferentially adjacent permanent magnets, the circumferential pitch angle of the three permanent magnets of each set is 26.7°, and the circumferential pitch angle of permanent magnets within the other two sets disposed at a symmetrical position is 33.3°.

11. A permanent magnet rotary electric machine as set forth in claim 4, wherein the number S of slots is eighteen, the number P of magnetic poles is twelve, and the twelve permanent magnets are divided into four sets of three circumferentially adjacent permanent magnets, the circumferential pitch angle of the three permanent magnets of each set is 28.3°, and circumferential pitch angles of adjacent permanent magnets between adjacent different sets are set to 33.3 °, 28.3 °, 33.3 °and 28.3° circumferentially in this order.

13. A permanent magnet rotary electric machine as set forth in claim 1 wherein the coil windings of each group are circumferentially separated from each other by at least one coil winding of another group.

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14. A permanent magnet rotary electric machine as set forth in claim 1 wherein coil windings are formed around each of the cores.